# U.S. NONPROVISIONAL PATENT APPLICATION

## PACKAGING SYSTEM FOR PRODUCE OR THE LIKE

**Franklin Sanabria**
**Tibás, Ubanización Las Rosas #22**
**San José, Costa Rica**

**Francisco Rodríguez**
**Carrillos Bajo de Poás**
**Calle El Molino**
**Alajuela, Costa Rica**

**Miguel Barrantes**
**Moravia Ubanización Los Colegios**
**San José, Costa Rica**

**Attorney Docket No. 91537.510978**

**Kevin S. Sprecher**
**Registration No. 42,165**
**FROST BROWN TODD LLC**
**2200 PNC Center**
**201 East Fifth Street**
**Cincinnati, Ohio 45202**
**(513) 651-6121**

"Express Mail" mailing label number

EV 311435854 US

November 19, 2003
Date of Deposit

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR §1.10 on the date indicated above and is addressed to Mail Stop: Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Kevin S. Sprecher
(Type or print name of person mailing paper of fee)

Signature

26874
PATENT TRADEMARK OFFICE

CinLibrary/1346738.1
91537.510978

# PACKAGING SYSTEM FOR PRODUCE OR THE LIKE

**Franklin Sanabria**

**Francisco Rodriguez**

**Miguel Barrantes**

## BACKGROUND OF INVENTION

This application claims priority benefit of United States Provisional Patent Application No. 60/427,435 filed November 19, 2002.

### Field of the Invention

This invention relates to an improved container system. More particularly, the invention relates to an improved container system for ventilating and storing products in a stacked or palletized arrangement, particularly perishable products such as bananas. The invention also relates to an improved packaging system that helps to preserve the quality of perishable products such as produce from the packing station where the produce is grown and harvested until it arrives in front of the final customer in a retail setting.

### Description of Related Art and Summary of the Invention

Most products must be shipped from one point to another prior to their sale to consumers, and are usually stored for a period of time at one or both locations. During shipping and storing, however, ventilation, heating, and/or cooling must often be provided to the products for various reasons. Perishable products such as fruit, for example, may require ventilation and cooling in order to maintain their freshness. Without such ventilation or temperature control means, these products might arrive at their final destination in a spoiled or damaged condition. Thus, it is usually not sufficient to merely package these perishable products in closed containers.

Previous containerization methods for perishable products such as fruits and

vegetables have often employed containers having various ventilation means. For example, it is common for produce to be shipped to retailers from the location where it is grown in corrugated boxes having a plurality of ventilation openings. These corrugated boxes not only provide a means for ventilating and controlling the temperature of the produce, but are also light-weight and relatively inexpensive to manufacture.

Many products such as fruits and vegetables also have ventilation and temperature parameters which must be varied during shipping and storing. Thus, at certain points during the shipping and/or storing periods it may be necessary to increase ventilation, or raise or lower the temperature of the products in order to ensure optimal freshness. One product for which this is particularly true is bananas. Bananas are typically packed in the form of banana clusters (or hands) into corrugated containers (i.e., boxes) at the plantation where they are harvested in a very green, unripened state. These cardboard boxes are then placed within large shipping containers, which are in turn placed in refrigerated ships. During shipment the pulp temperature of the bananas is typically kept at a temperature between 56° and 59° F. Once the ship has docked, the bananas are transferred to refrigerated trucks or rail cars, and transported to a warehouse or the like. Once again, the pulp temperature is maintained between 56° and 59° F in order to retard the ripening of the bananas, thereby prolonging the shelf life of the bananas. In order to maintain this temperature range, it is necessary to provide ventilation means within the cardboard or corrugated boxes. This is typically achieved by providing a plurality of ventilation openings about the surfaces of the boxes. In this fashion cooled air can be circulated within the boxes, thereby maintaining the proper pulp temperature.

Once the bananas have reached the warehouse, the boxes are placed in ripening rooms where the pulp temperature is permitted to rise to about 60° to 62° F. Ethylene gas is also circulated about and within the containers by means of the ventilation openings. The combination of increased temperature and ethylene gas will hasten the ripening process, thereby reducing the time necessary for the bananas to fully ripen. Once this process has been completed, however, it is desirable to remove ethylene gas and decrease the temperature of the bananas in order to decelerate ripening. Since the ripening process within the bananas themselves releases ethylene gas, and since the ripening process will

continue even at temperatures below 60° F, it is critical that sufficient ventilation be provided in order to reduce the pulp temperature and remove ethylene. Thus, once the bananas are removed from the ripening rooms and transported to the retailer, it is usually necessary to take steps to ensure that increased ventilation can be provided to the bananas. If the ethylene gas is not removed from the bananas or the temperature is not sufficiently decreased, the bananas will continue to ripen at an accelerated rate, thereby shortening their shelf life. Thus, the containers and packaging employed for bananas must be able to account for the varying ventilation and temperature control needs during the shipping and storing steps.

Other products, including other fruits and vegetables, require similar handling, and may have varying needs during the shipping and storing processes. Thus, there is a need for a container system for products, as well as a method for packing, shipping and storing these products, that will ensure proper shipping and storing conditions. While many of the containers and methods employed in the past have met the needs of producers and retailers, these containers and methods usually required a considerable amount of handling. Additionally, there is always a need for containers and packing methods which improve the shelf life, appearance, and freshness of perishable products such as fruits and vegetables.

The container of the present invention includes an improved ventilation pattern for perishable products such as produce contained therein. The ventilation pattern of the improved container advantageously allows for corresponding ventilation apertures of adjacent containers to be in communication thereby advantageously improving airflow through an entire palletized load of containers of produce thus allowing for faster cooling or "pull down" rates. Additionally, known prior art containers have frequently exhibited poor ventilation characteristics. For example, fruit has been known to obstruct or even block poorly configured ventilation apertures of prior art containers. This undesirable situation often leads to uneven or diminished air circulation between boxes in the same layer thereby creating undesirable "hot spots" in the middle of layers of the stacked or palletized boxes. Produce has also the risk of being damaged due to the physical contact with the edges of ventilation holes due to the orientations of prior art ventilation holes.

Further, prior art containers may have even further reduced air circulation between layers of boxes due to prior art configurations of stacking fruit within plastic bags and between paper tunnel pads.

As will be explained in greater detail, the container of the present invention improves ventilation of individual containers (and palletized loads of containerized produce) by incorporating ventilation holes in the upper and lower perimeters of each container in such a way that ventilation apertures of adjacent containers may be in communication with corresponding ventilation apertures of one or more adjacent containers. Specifically, corresponding ventilation apertures of adjacent containers may be shared by adjacent sides or adjacent tops and bottoms of adjacent containers. To effect this arrangement, at least some of the ventilation apertures each include a first part along the vertical panel and the second part disposed in either the upper or bottom surface or flap of the container. Advantageously, this arrangement has been shown to reduce the occurrence of blockage of apertures by the contained fruit that occurs when vents are located around the middle of the vertical panels. This arrangement also, as mentioned previously, allows for the vertical intercommunication between boxes of adjacent layers.

Bananas (and other produce) are usually packed in four rows. The two first rows are typically covered with a paper tunnel pad to improve pack stability and protect these lower rows from damage that could be caused by rubbing against the overlying top two rows. A problem associated with the prior art arises from the difficulty for effective heat exchange and ventilation for the lower two rows of fruit because they are enclosed by the paper tunnel pad. The direct effect is a further delay of cooling speed for these rows compared with the top two rows that are typically more exposed. As should be appreciated, this arrangement has often resulted in undesirable temperature differences among the rows of fruit and layers of containers during transportation and ripening.

The container of the present invention optionally includes an improved paper tunnel pad with improved ventilation characteristics. In the prior art, the tunnel pad typically includes a series of vent holes located to coincide and align with the bottom gap in the container. Although the bottom opening or gaps in prior art containers are typically large,

almost no effective air circulation has been achieved through it because fruit atop the gap blocks this space. The improved tunnel pad design includes additional ventilation holes placed to coincide with the container ventilation apertures in the lower perimeter of the containers in such a way that air circulation is improved.

Additionally, limited ventilation of the prior art containers made necessary the use of a plastic bag with a relatively very high number of ventilation openings to enable adequate cooling and ripening to proceed and to yield a product with a fairly uniform color and temperature. Although such prior art bags achieve improved ventilation, they have been associated with allowing for undesirable levels of produce dehydration and freshness loss. Accordingly, the present invention also optionally includes an improved produce bag with a relatively fewer number of ventilation holes and with holes strategically located to have a better correspondence with box and tunnel pad ventilation openings. Preferably, unlike prior art bags having more than two-hundred holes of about ½ inch diameter, the new bag design preferably includes from about 20 to about 150 holes with diameters ranging from about 5/32" to about 1/2".

In accordance with an alternate embodiment of the present invention, and in order to further improve temperature and ripening uniformity, an improved system of inner container components is provided as an alternative to the inner bag and tunnel pad of the present invention described in the previous paragraphs. This embodiment comprises an external relatively shorter bag, an internal pad pouch and a small paper pad disposed in the pad pouch.

The cooling features of the container of this invention not only decrease the required cooling times, but also increase uniformity in fruit temperature through the entire pallet load of stacked boxes, homogenizing in this way the green life of all fruit contained in them.

Beside the above mentioned advantages during transportation, the design involved in this invention also improves fruit temperature management during the ripening process. When the fruit ripening is triggered by gassing with ethylene a chain reaction starts inside

the fruit. All of these reactions emit heat and a good heat and gas exchange is required to keep fruit temperature at the desired temperatures to have the process under control.

During the stay of the fruit in the back room of the stores, usually at ambient temperatures, fruit further continues the ripening process and therefore, its continued heat generation continues causing pulp temperatures to increase accelerating the color change and the fruit senescence process. The improved ventilation of this invention also operates to lengthen the useful life of the ripe fruit.

Further, the container system of the present invention allows this improved temperature and ventilation management without decreasing the container strength. In the design of this invention no loss of the top to bottom compression strength is achieved as compared with the prior art containers because no increase in the open area or number of cut flutes are increased in the vertical structure of the container. The extra ventilation and the new allowance for intercommunication between layers is provided in the segments of the container openings that are located in the horizontal top or bottom flaps of the boxes. As a result, they have no adverse effect on the compression tendency of the containers. Some attempts have been made in the past to achieve better ventilation, but all of them resulted in lowered box strength.

## BRIEF DESCRIPTION OF THE DRAWINGS

While the specification concludes with claims particularly pointing out and distinctly claiming the present invention, it is believed the same will be better understood from the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a perspective view of the improved container of the present invention;

Fig. 2 is a perspective view showing two layers of a palletized load of containers of the present invention showing the alignment of adjacent ventilation apertures of adjacent containers;

Fig. 3 is a flat plan view of an unassembled top portion of the container of the

present invention;

Fig. 4 is a flat plan view of an unassembled bottom portion of the container of the present invention;

Fig. 5 is a flat plan view along the length of the container of the present invention;

Fig. 6 is a flat plan view across the width of the container of the present invention;

Fig. 7 is a top plan view of the container of the present invention;

Fig. 8 is a plan view of the tunnel pad of the present invention;

Fig. 9 is a plan view of an inner bag adapted for use with the container of the present invention;

Fig. 10 is a plan view of an optional inner bag adapted for use with the container of the present invention;

Fig. 11 is a plan view of an optional tunnel pad pouch adapted for use with the container of the present invention;

Fig. 12 is a plan view of a relatively smaller tunnel pad adapted to be contained within the pouch shown in Fig. 11; and

Fig. 13 shows optional tunnel pad disposed within the optional tunnel pad pouch.

## DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to the presently preferred embodiment of the invention, examples of which are illustrated in the accompanying drawings, wherein like numerals indicate the same elements throughout the views.

With reference to Fig. 1, an improved ventilated container 10 for shipping produce is provided. The container 10 may be employed for shipping fresh fruits and vegetables such as bananas. The container is preferably comprised of recyclable corrugated board but may be comprised of essentially any suitably durable material. The container generally comprises a top portion 12 as shown in Figure 3 and a base portion 14 as shown in Fig. 4

and is commonly referred to as a full-telescoping, half-slotted container (HSC). When assembled, and as shown in Fig. 1, the container 10 includes a top panel 11, a first pair of opposed short panels 13 (Fig. 6), a second pair of opposed long panels 17 (Fig. 5), and a bottom panel 15. According to one aspect of the present invention, a plurality of ventilation apertures 16 is disposed on the container 10. Although any number of ventilation apertures may be used to achieve desired ventilation, the container 10 preferably includes eight ventilation apertures 16 disposed substantially equidistantly along the bottom perimeter and eight ventilation apertures 16 disposed substantially equidistantly along the upper perimeter of the container 10. Preferably, the apertures are round but may be of any suitable shape to effect ventilation. Preferably, the apertures 16 are of a diameter of about 1 inch to about 3 inches. As best shown in Figs. 1-4, it can be seen that the ventilation apertures are placed such that their widest points coincide with the horizontal scores that fold when each piece of the container is erected. In other words, it is preferable that each ventilation aperture 16 is disposed in part on either a short panel 13 or a long panel 17 and the other part of the aperture is disposed on an adjacent top panel 11 or bottom portion 15.

The top portion 12 and base portion 14 are preferably of approximately equal depth as shown in Figs. 3 and 4. To assemble the container 10, the top portion 12 telescopically slides over base portion 14. As can be seen, the ventilation apertures 16 in the base portion 14 and top portion 12 are aligned when assembled into a container 10. The top and bottom portions each have flaps which are folded over and glued to one another in order to close each portion. Alignable hand slots 18 are provided for additional ventilation and for ease of transporting the container 10. When the container is erected the ventilation apertures are located in the upper edge of the top portion 12 and the bottom edge of base portion 14.

As shown in Figs. 1-4, the ventilation pattern of the present invention, unlike some of the prior art, does not include ventilation holes 16 in the middle regions of panels 13 and 17 that may be blocked or obstructed by produce or fruit contained therein. In contrast, the container of the present invention provides an improved ventilation pattern for bananas or other fresh fruit. The design enhances the air circulation through the entire pallet load

allowing faster cooling rates. The optimization of cooling is achieved by locating the box ventilation holes in the upper and lower perimeters in such a way that they are shared by adjacent panels of the container as described previously. This design further minimizes the likelihood of scarred fruit resulting from fruit engaging the ventilation apertures.

Fig. 7 illustrates a top plan view of the top portion 12 of the container 10. As can be seen in the figure, approximately one half of each ventilation aperture 16 is disposed on the top of the container about the edge of the top portion 12. The remaining half of the ventilation aperture is disposed on an adjacent vertical panel 13 or 17. Similarly, the base portion 14 includes a preferably similar ventilation aperture configuration. This advantageously allows for the vertical intercommunication between boxes of different layers as shown in Figure 2. As shown in Fig. 7, a central ventilation region 20 is present in the top portion of the container and is present as well in the base portion 14 of the container. As a practical matter, most ventilation through this region 20 tends to be blocked in prior art HSC boxes due to the fruit disposed thereon or thereunder.

Again referring to Fig. 2, it is shown how the intercommunication between the containers of this invention is achieved when stacked in a pallet load. As can be seen from the figure, ventilation communication is achieved between boxes of the same layer or level in the pallet load and between containers of consecutive layers. As shown in the preferred embodiment of the figures, each container has a total of eight open, free air flow channels to communicate horizontally with the neighboring containers in the same layer or with the external cooling air. At the same time it can be observed that their ventilation is also interconnected vertically with containers of the adjacent upper and adjacent lower layers through the same number of ventilation apertures.

As described previously, bananas are typically packed in four rows in a container. The two lower rows are typically covered with a paper tunnel pad to improve pack stability and to protect these lower rows from damage, abrasion and scarring that could be caused by the top two rows. The two lower rows of fruit enclosed by the tunnel pad as a result have been harder to ventilate adequately as compared with the top two rows of fruit in a

container. As such, undesirable temperature differences have resulted within prior art containers during transportation and ripening.

As shown in Figure 8, the container of this invention includes a special paper tunnel pad 24 with improved ventilation characteristics. Ventilation holes 28 are arranged in groups and are placed to coincide both with the ventilation region 20 and with the apertures 16 in the lower perimeter of the containers in such a way that air circulation is maximized.

When perishable products are shipped in HSC containers, a plastic inner wrap or bag 30 is employed to protect the fruit. This inner wrap is typically a tube made of this plastic with a plurality of ventilation slits provided about the surface of the bag 30. The bag is typically placed in the base portion 14 and the open edges of the bag 30 are draped over the sidewalls of the container. In this fashion fruit, such as bananas, may be layered therein. The limited ventilation of the prior art containers forced the producers to use a plastic bag with a very high number of ventilation openings to enable the cooling and ripening process to proceed adequately and to produce a final product with a fairly uniform color and temperature. Such bags tended to achieve desired ventilation by caused undesirable fruit dehydration and freshness loss. Accordingly, the present invention also includes an improved bag 30, as shown in Fig. 9, with fewer ventilation holes 32 but with holes 32 placed to have a align with ventilation apertures 16 of the container 10 and the ventilation holes 28 of the tunnel. For example, instead of having more than 200 holes of ½ inch diameter as is common in the prior art, the improved bag incorporates about 20 to about 150 holes with smaller diameters ranging from preferably about 5/32 of an inch to about ½ inch.

An alternate tunnel pad and bag configuration adapted for use with the present container is shown in Figs. 10-13. This embodiment preferably includes a relatively shorter bag 30 (Fig. 10) and an internal plastic pad pouch 50 as shown in Fig. 11. The pouch has an open end 52 adapted to receive a tunnel pad 56 as shown in Figs. 12 and 13. Similar to prior art systems, this alternate tunnel pad arrangement may be used for crowns-up packing patterns for bananas, which are typically three row packs. Further they may be used with

conventional four row or crowns down packs of bananas. The pouch 50 is preferably plastic and is formed by a double plastic sheet that is open at the top 52 and to form a pouch that holds the paper pad 56 inside it as is shown in Fig. 13 . Preferably, of two heat sealed seams are placed perpendicularly to the open side to form the pouch. Advantageously, this arrangement minimizes or eliminates contact of the fruit with the paper tunnel pad. Both the plastic pouch 50 and the paper 56 are highly perforated to enhance uniformity in temperature and color within all fruit rows. Paper acts as a latex absorber as well.

Testing of the container system of the present invention has demonstrated not only advantageously decreased cooling times, but also increased uniformity in fruit temperature through the entire pallet load of stacked containers thereby achieving substantial homogenization of the unripe or green life of all fruit or bananas contained therein. This design has also proven to improve fruit temperature management during the ripening process when the fruit ripening is triggered by gassing the fruit with ethylene. As a result, bananas are delivered to retail with a narrower, more uniform range of color distribution and with fruit of similar ripeness and a longer useful life.

As mentioned previously, this container allows this improved ventilation and temperature management to occur without any decrease in the container strength: the number of flutes cut in the vertical box panels to make the ventilation holes always produce some decrease in box strength. In the present invention no undesirable reduction of top to bottom compression strength is realized as compared with prior art HSC containers because no increase in the open area or number of cut flutes is effected in the vertical structure of the container and because each one of the ventilation apertures 16 is split substantially in two halves is on two adjacent panels.

The foregoing description of a preferred embodiment is by no means exhaustive of the variations in the present invention that are possible, and has been presented only for purposes of illustration and description. Obvious modifications and variations will be apparent to those skilled in the art in light of the teachings of the

foregoing description. Thus, it is intended that the scope of the present invention be defined by the claims appended hereto.